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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of: **KIKUGAWA, Atsushi et al.**

Group Art Unit: **2643**

Serial No.: **09/924,476**

Examiner: **OLTMANS, Andrew L.**

Filed: **August 9, 2001**

P.T.O. Confirmation No.: 2643

For: **RARE EARTH METAL-BASED PERMANENT MAGNET HAVING CORROSION-RESISTANT FILM AND METHOD FOR PRODUCING THE SAME**

DECLARATION UNDER 37 CFR 1.132

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Technology Center 2600

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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Sir:

I, Fumiaki Kikui, a citizen of Japan, hereby declare and state the following:

I am a co-inventor of the invention of United States Patent Application Serial No. 09/924,476.

I have read and am familiar with the above-identified patent application as well as the Official Action dated May 12, 2003 and the cited references, particularly Japanese Patent JP 2000-150216 (JP'216) of which I am a coinventor.

I and/or those under my direct supervision conducted the following experiments:

In the treatment solution described in Example 2 of JP '216, a magnet test piece used in Example 2 of the present application (no aluminum layer) was immersed at a bath temperature of 50°C for 1 minute and 30 seconds. Subsequently, the magnet test piece was pulled up from the treatment solution and dried at 120°C for 20 minutes.

The surface of the magnet test piece after drying was observed to find that it did not change compared with the surface of the test piece before immersion in the treatment solution and that formation of a chemical conversion film was not recognized. Further, when the surface components were analyzed using EPMA-1610 (manufactured by Shimadzu Corporation), it was confirmed that there were portions where P and Zr existed. However, it was thought that these components were derived from the treatment solution which adhered to the surface of the test piece.

As to the reason why the results as stated above were obtained, I think that it is reasonable to explain the reasons as follows.

When the treatment solution is applied to the Al film formed on the surface of the magnet test piece as in Example 2 of JP '216, dissolution of Al is caused by F ions contained in the treatment solution as an essential component. Dissolved Al ions generate insoluble intermediates such as AlF_3 and $Al(OH)_3$. It is thought that these insoluble intermediates act suitably on precipitation of the components of the chemical conversion film caused by a reaction of a zirconium compound and phosphoric acid in the vicinity of the surface of the Al film, whereby a uniform chemical conversion film is formed on the surface of the Al film.

On the other hand, when the treatment solution is applied to the magnet test piece, F ions cause dissolution of Nd and Fe constituting the magnet test piece, but dissolved Nd ions and Fe ions do not generate insoluble intermediates with the F ions or even if these ions generate insoluble intermediates, the amount of the generated intermediates is extremely small. It is thought that this condition does not act at least suitably on precipitation of the components of the chemical conversion film in the vicinity of the test piece, and as a result, dissolution of Nd and Fe caused by the F ions prevented the chemical conversion film from being formed on the surface of the test piece.

I think that the passive film at a portion where the Al film has not been completely formed described in paragraph [0030] of JP '216 is formed in the following manner. That is, I think that in the process of forming the chemical conversion film on the surface of the Al film, P, which is one of the components of the chemical conversion film precipitated on the surface of the Al film enters as anions of a compound (phosphoric acid or the like) together with moisture existing around it into the portion where the Al film has not been completely formed. Then, these react with Nd and Fe (which become counter cations of the compound anions of P) constituting the magnet test piece. Of course, the treatment solution may enter directly into the portion where the Al film has not been completely formed. However, said portion is very small so that it is presumed that in this portion, the above reaction occurs preferentially before dissolution of Nd and Fe caused by the F ions contained in the treatment solution. At said portion, Zr ions contained in the treatment solution are not involved in formation of the passive film as counter cations of the compound anions of P. Even if the Zr ions are involved in the formation, the extent of involvement is extremely small. Therefore, I think that it is certain that the passive film formed as stated above and the chemical conversion film formed on the surface of the Al film are different in composition of the components.

From the above experimental results and consideration, the chemical conversion film formed on the surface of the magnet in the present invention is different from both the chemical conversion film formed on the surface of the Al film and the passive film at a portion where the Al film has not been completely formed described in JP '216.

The undersigned declares that all statements made herein of his/her own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code and that willful false statements may jeopardize the validity of the application or any patent issued thereon.

Fumiaki Kikui

Fumiaki Kikui

Signed this 1st day of September, 2003